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No. 17. REVIEW OF THE GENUS *GENNAEUS*

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No. 18. NOTES ON COSTA RICAN BIRDS

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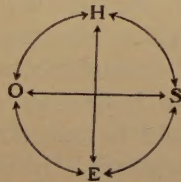
## REVIEW OF THE GENUS *GENNAEUS*

By C. WILLIAM BEEBE,  
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### PART I.

Evolution as a phenomenon is beyond dispute. The exact methods of evolution are only partly clear. We have so far failed to discern many of the ways and means by which the organisms of our day have acquired their adaptations, have differentiated their tissues, or have survived the competition of past generations. One thing is certain: no single theory will suffice to account for the evolution of life in general, nor even for a single organ of any individual. If careful study of the subject has taught us nothing else, it has constrained us to believe in multiple causes; in an eternal plexus of actions and reactions. And it is as impossible to believe that any one character subserves only a single function throughout the life of an individual, as that its inception in past time—whether gradual or sudden—and its development, was brought about solely by the action of any isolated factor.

I wish that every worker along the lines of evolutionary research would pin to his desk, place in his watch or strive always to keep vividly in both conscious and subconscious thought some such symbol of the eternal interaction of factors as Prof. Henry F. Osborn has given us.<sup>1</sup>



Heredity  
Ontogeny  
Environment  
Selection

With such a "wheel of life," both controlling and stimulating, there would be less swinging of the pendulum to extremes,

<sup>1</sup>Science. XXVII 1908, p. 14; and Jour. Acad. Nat. Sci. Phila. XV. 1912, p. 298.



less striving to make every fact, every color, every hybrid, every tropism, fit some pet theory. There would be less arbitrary refutation, more leniency in perceiving the modicum of truth which may lie at the bottom of the most unpromising theory. This is the principal thought which the study of the family of pheasants has aroused; the realization of the plexus of factors dominating or indirectly affecting the evolution of the race and the development of the individual.

## PART II.

The name *Euplocomus* was established by Temminck eighty-four years ago (1830), and has been expanded and maintained by many excellent authorities since that date. Today it is generally admitted to be a compound group and has been divided into as many as five genera. These are *Gennaesus*, *Hierophasis*, *Diardigallus*, *Lophura* and *Acomus*. Any careful study of the comparative claims of this quintet to full recognition, emphasizes most profoundly the wholly artificial character of any linear classification, and although the discussion of this is not the main thesis of the paper, yet it is interesting to consider it briefly; especially as I wish to illustrate the thought presented in Part I.

In recent years there has been a redundancy of discussion as to whether species owe more to continuous or to discontinuous variation, a better term for the latter being saltation. For several reasons I purposely avoid using the term mutation in this brief paper. When I began my studies of the pheasants I was consciously or subconsciously prejudiced against the "mutation theory," chiefly perhaps because it appeared that altogether too much was claimed for it, and if the most convincing proof of any given mutation required several generations, there was slight chance of demonstrating it among birds save in a few isolated, favorable instances. But the more I observed such species as the Golden and Amherst Pheasants (*Chrysolophus pictus* and *amherstiae*), the color relations in both sexes, and the results of hybridism, the more necessary some such phenomenon as saltation appeared to be, in these particular instances. That saltations occur in this family I consider satisfactorily proved by the Black-throated Golden

Pheasant and the Black-shouldered Peafowl. I am now of the opinion that both forms of variation have been operative in the origin of wild forms and that the difference between them is pronounced if not profound. As an example of continuous variation I would cite the entire genus *Phasianus* (as I have recently restricted that group<sup>1</sup>). The supergenus *Euplocamus* well illustrates in its generic divisions what seem to be saltations.

The moment one attempts to define genera and subgenera in such a homogeneous group of organisms as the pheasants, one becomes aware of the personal equation. In the division into subfamilies I have sought to eliminate this by making use of the only consistent character which I could discover, namely, the sequence of moult of the tail feathers. With the impossibility of appeal to osteological or other fundamental characters, we are compelled to fall back upon purely superficial distinctions. Where the resemblances are as numerous as the differences, and yet when convenience in discussing the various groups demands some taxonomic isolation, however artificial, one again instinctively begins a search for something which will help to eliminate the personal element. This personal equation is in very truth affected by H and O and E and S, and its variation is enormous. So it behooves one to attempt to base one's taxonomic belief on something more stable and more acceptable to foreign fellow ornithologists, than the mere *credo* derived from the multitudinous mental forces, both true and erroneous, resulting from American education and American environment.

Looking over the groups of pheasants, in number about a score, it seems to me that there is a criterion which may be adopted for differentiation into genera. Like the sequence of tail moult it is a character which must be consistently applied throughout the family, and, also like that character, it is abstractly doubtless of no value, at least in many other families of birds. But if it helps in deciding a few cases which seem so evenly balanced that their position might rest upon the turn of a coin, it will be worth while. This factor which throughout my studies has gained in cumulative significance, is that, *no two species of any one genus occupy the same geographic area*. This

<sup>1</sup> Preliminary Pheasant Studies, Zoologica, I. No. 15, 1914, pp. 283-284.



is true of so many groups that with the removal of *reevesi* and *soemmerringii* from *Phasianus* it holds good throughout the pheasants. And now in considering the status of the euplocamine pheasants, we are able, by applying it, to make our division rest on something beside wholly tentative and altogether artificial separations.

For in this case we are dealing with generic relationships of so subtle and complex a nature that a satisfactory decision on mere color and pattern and crest characters seems impossible. By invoking unlimited additional taxonomic castes or by employing a classification imagined in the three planes of space, the whole matter is at once simplified. For example, few would object to this scheme:

Subfamily *Phasianinae*.

Supergenous *Euplocamus*.

Genus *Gennaesus*.

Subgenus *Hierophasis*.

Then again an additional division, called perhaps Section, should be instituted to include the Fire-backed Pheasants, *Diardigallus*, *Lophura* and *Acomus*, occupying a distinct niche between the subfamily and supergenous. And so on.

The fineness of the distinction is well shown by the following groupings:

Classification by

Fiery-back	{ Gennaesus + Hierophasis Diardigallus + Lophura + Acomus
Number of rectrices	{ Gennaesus + Hierophasis + Diardigallus + Lophura Acomus
Color of facial wattles	{ Gennaesus + Hierophasis + Diardigallus Lophura + Acomus

Taking into consideration the distributional factor, we find (as in the utilization of the tail-moult character) that one of

the most generally accepted classifications remains undisturbed. My new point of view merely provides a more logical, consistent basis. With its accompanying rough summary of geographic distribution, I suggest the following:

Genus *Gennaëus* Himalayan Terai, Assam, Burma, South China, Formosa, Annam, Hainan.

Subgenera *Gennaëus*

*Hierophasis*

Genus *Lophura* Siam, Malay Peninsula, Sumatra, Borneo.

Subgenera *Diardigallus*

*Lophura*

Genus *Acomus* South Malay Peninsula, Sumatra, Borneo.

If *edwardsi* proves to occupy the same territory in general with some more typical *Gennaëus*, I should at once remove it, together with its close relation *swinhoii*, and give *Hierophasis* full generic recognition. This has as many characters to warrant it as militate against it. The final settlement of its position should always be consistent with the chief use of taxonomy; clarity of relationship combined with the greatest use to the widest circle of workers.

The two points which I wish to emphasize are, first, the existence of two distinct types of specific relation in the family of Pheasants; and second, the possible correlation of generic distinction with geographic isolation.

### PART III.

For many reasons the genus *Gennaëus* is the most interesting in the family *Phasianidae*, and especially because of the puzzling nature of many of the forms. The birds of this group are commonly called Kaleege and Silver Pheasants. It will result in least confusion and comply with the custom of more ornithologists if the former be used as a common generic term.

In the field, my experience with these birds extends from the haunts of *albocristatus* in Kashmir to *nycthemerus* in Fok-



ien, and from *horsfieldi* in Upper Burma to *lineatus* in Lower Burma. I collected or made notes upon many of the forms, not only of adults in full plumage but of moulting birds and those in immature dress. Forearmed with the details of what had already been published on the subject, I was able to search more intelligently and with more direct design than would otherwise have been the case. More than this, however, was the aid given by the English sportsmen in Burma, who in some cases furnished me with data and specimens which were of the greatest help. In several instances these were the very men who had collected the original types, so their assistance cannot be overestimated.

In the study of museum specimens I was not so fortunate. The Indian Museum in Calcutta was open to me and there I found and studied a very good collection, including the types of *andersoni*, *melanonotus* and several other unique pheasants. The museums of Paris and Berlin also possess interesting specimens but Oates' collection of *Gennaesus* at the British Museum with over one hundred and sixty specimens and at least fourteen types was not available for study in the summer of 1912. Now that two years have passed and no report has been made upon this collection I offer a preliminary summary of my study of this group, depending upon Oates' published descriptions of his supposed species. I am quite sure that any future investigations of the British Museum collection will in no way affect the general results I have reached.

I feel all the more certain in stating this belief because I find myself in almost perfect agreement with Prof. Alessandro Ghigi. It is most significant that while the conclusions of this Italian ornithologist were reached by a study of the phenomena of experimental hybridism and mine by independent observation of wild shot individuals, our results differ only in very minor details. His paper to which I refer is *Ricerche di Sistematica Sperimentale sul genere Gennaesus Wagler*<sup>1</sup>, forming the most thorough and masterly contribution to the subject which has yet appeared. Owing to the excellent keys and descriptions which he presents, I omit their duplication in this paper, giving only my general studies and results.

<sup>1</sup> Memoria R. Accademia delle Scienze dell' Istituto di Bologna, 1909.



The tangle which has arisen about this genus centers in Burma, and, in a word, the whole question resolves itself into whether the numerous forms which have been described from that country are valid species and subspecies or only hybrids, the naming of which might be continued indefinitely without benefit to the understanding of the genus.

In order even to begin to clear up the problem it is necessary to have a definite starting point and for this I have chosen the Lineated Kaleege (*G. lineatus*). Geographically and pigmentally this species occupies a central position. From the point of view of color and pattern it is the most generalized of all the species, while its uniformity over almost its entire range leaves no doubt as to its right to true specific recognition. The black and white on the upper plumage is broken up into fine vermiculation, the two being about equal in extent, the very specialized color extremes of solid white or black being thus lacking. A further hint of its more generalized type is the superficial resemblance which it bears to the nearly related tropical genera, *Acomus* and *Diardigallus*.

From this point even a superficial survey of the genus shows two, and very probably three main lines of divergence. To the north and westward along the Himalayan terai extends a succession of dark feathered birds, in which the whites are reduced or concentrated on certain limited portions of the plumage. From east to west these are *horsfieldi*, *melanonotus*, *leucomelanus* and *albocristatus*. In all four there is a small amount of variation, but, *inter se*, no actual crossing has ever been recorded in a wild state, nor did most careful search and inquiry on my part reveal a single instance. I have taken this up in detail in my monograph and there is no need to reproduce it here.

It is important to note that the distinctions between the four Himalayan Kaleege Pheasants have been shown by Ghigi to behave in experimental crossing exactly as though they had been derived by mutation, not blending as do the characters of the Burmese birds.

To the northeast of *lineatus* we find a second line of *Gennæus* Pheasants, of which the most widely distributed is *nycthe-*

*merus*, the Silver Kaleege. On the island of Hainan is an offshoot from this, *whiteheadi*, quite close to the typical species, but of course worthy of specific recognition on account of its complete geographic isolation.

A third line, quite distinct from *lineatus*, is found to the southeast in Annam. This is *edwardsi* whose connection with *lineatus* at least as a direct offshoot is at present somewhat obscure. Although it is known only from a few specimens from Annam, yet its rather close relationship with *swinhoii* is of great interest. The latter inhabits the island of Formosa, and with its tropical, *Lophura*-like brilliance of color differs much from *nycthemerus*, the only species at present inhabiting southeast China. *Edwardsi*, however, shows a very probable linking relationship, less specialized, and much nearer the supposed center or origin.

After carefully going over all the data available, I cannot see that there are any other species worthy of recognition on grounds similar to the nine Kaleege I have mentioned.

Centering our attention again on Burma and the adjacent Chinese states, we find that most of the country is occupied by three species, *lineatus*, *horsfieldi* and *nycthemerus*. Now in all the genera of pheasants there is, as far as I know, no case of two congeneric species occupying the same territory. This was not true as long as *reevesi* and *soemmerringii* were included in *Phasianus*, a very obviously erroneous association, which I have attempted to better. We find that in addition to the nine *Gennaetus* I have already mentioned, there have been described under binomial names, no fewer than twenty-six forms. Almost without exception these are all found within the range of one or the other of the three above mentioned, widely-distributed species, and not only this but they occur along the borders where the three approach one another. After studying these forms from every point of view possible, there is no doubt whatever in my mind but that all are feral hybrids. In some way after the three main types of Kaleege became differentiated, they approached one another again, working along the narrow, intersecting valleys of Central and Upper Burma, where cross-breeding took place, apparently as freely as it does in captivity. The



English ornithologist, Mr. Eugene W. Oates, toward the end of his life, became interested in these Burmese Kaleege and gathered all the specimens possible. He had no belief in the hybridizing of these birds, and so strong was this attitude, that the naming of new forms became an obsession with him. He grew intolerant of criticism and welcomed neither argument nor proof, however convincing, that any of his species were other than normally evolved forms. But aside from this, his work was sincere, and however limited his ability to view the subject from more than one angle, he at least labored to gather together a splendid collection, and we are greatly indebted to him for giving this unusual phenomenon such prominence.

Of the twenty-six so-called species, Oates is responsible for nineteen, a goodly percentage of which were based on single specimens.

The conclusions which Ghigi draws from his experiments seem important enough to quote in full, both the original and the translation.

"Returning to the birds forming the subject of the present study, if we proceed to examine *G. leucomelanus* and *G. horsfieldi*, or rather this last one and *G. lineatus*, we see that they differ in a complexity of characters, which, in the hybrids are so arranged as to produce an intermediate form, or else, they transmit them in a different association from that existing in the progenital species. Granted that these intermediate forms or with the characters associated in a different manner, may be constant in their descent, it is clear that two distinct species have the power to give origin to a new form by crossing.

"If, however, we consider *G. leucomelanus* and *G. muthura* or else the first and *G. albocristatus*, it is clear that from hybrids between them, we are not able to obtain new forms, as the difference consists in each case of only one pair of characters, antagonistic and unresolvable. The hybrids of the first pair will have the white fringe on the rump or will not be provided with it; those from the second pair will have the crest black or will have it white; they will belong then either to one or the other species; and even if they should be intermediate in the sense of having the white fringes not as large as in *leucomelanus*, or the

crest not as light as in *albocristatus*, it is plain, that they cannot give origin to any new subspecies, because from what I have shown in my researches, and from what is established in the abundant hybridological literature of today, these hybrids, which differ in only two antagonistic characters, give place in successive generations to the separation of such characters according to the formula of Mendel, returning thence to the pure progenital species."<sup>1</sup>

After finding and studying the Himalayan Kaleege, I later visited Burma and there in the south first met with *lineatus*. My next studies took me to Mandalay, eastward beyond Maymyo, and northward toward the Ruby Mines District and Bhamo. I then spent considerable time in the Myitkyina District far up the Irrawaddy, and among the Shan Mountains to the east and south, to beyond the Yunnan border. Here, thanks to the exact details given me by Major Nisbett, I was able to collect and observe a number of the forms at the very localities where the types were collected.

From this very limited locality six forms of *Gennaecus* had been recorded. Of these I found no perfectly typical specimens, but pheasants which approximated four, besides a fifth which was not supposed to occur here. In addition I collected birds, which if judged by the characters used in separating the already named forms, would supply at least four additional species.

<sup>1</sup> Riportandomi agli uccelli che formano oggetto del presente studio, se noi prendiamo ad esaminare il *G. leucomelanus* ed il *G. horsfieldi*, oppure quest'ultimo ed il *G. lineatus* rileviamo che essi differiscono per un complesso di caratteri i quali, negl'ibridi, si fondono in maniera da produrre una forma intermedia, oppure si trasmettono in associazione diversa da quella esistente nelle specie progenitrici. Dato che queste forme intermedie od a caratteri diversamente associati, siano stabili nella loro discendenza, è chiaro che a due specie distinte compete la facoltà di dare origine per incrocio a nuove forme.

Se invece consideriamo il *G. leucomelanus* ed il *G. muthura*, oppure il primo ed il *G. albocristatus*, è chiaro che dalle unioni provocate fra di loro non si possono ottenere nuove forme, in quanto la differenza consiste per ciascun caso in una sola coppia di caratteri antagonisti ed indecomponibili. Gl'ibridi della prima coppia avranno le frange bianche sul groppone o ne saranno sprovvisti; quelli della seconda coppia avranno il ciuffo nero o lo avranno biancastro: apparterranno dunque nettamente o all'una od all'altra specie, e quand'anche essi fossero intermedi nel senso di avere le frange bianche non così ampie come nel *leucomelanus* od il ciuffo non così chiaro come nell'*albocristatus*, è evidente che essi non possono dare origine ad alcuna nuova sottospecie, perchè da quanto ho esposto nelle mie ricerche, e da quanto si rileva nella numerosa letteratura ibridologica odierna, questi ibridi i quali differiscono per due soli caratteri antagonisti, danno luogo nelle generazioni successive alla separazione di tali caratteri secondo la formula mendelliana, ritornando quindi alle specie progenitrici pure.



The species supposed to inhabit this region are the following:

1. *affinis* (1 male from the River Namli; two thousand feet; east of Myitkyina).

2. *granti* (1 male from Puntum; six thousand feet; eight miles east of Sadon).

3. *nisbeti* (An imperfect male from Mt. Kachin; twenty-five hundred feet; fives miles east of Sadon).

4. *cliffordi* (The district in general).

5. *batemani* (The district in general).

6. *horsfieldi* (The district in general).

At the locality from which *affinis* is recorded, the lower River Namli, I found only *horsfieldi*, which was dominant and almost typical, and a vermiculated bird associated with it which closely resembled the description of *obscurus*, but differed from it as much as do the most nearly related named species. The two forms were living in close association, the first flock containing three birds, all males, two of which were *horsfieldi*. In fact this was about the numerical percentage of the latter in this vicinity. On two occasions I saw a distinctly lighter bird in company with *horsfieldi* but I failed to secure it. My next stop was at Pungatong, some twenty miles farther east, at an elevation of about four thousand feet. Here I located a flock of eleven Kaleege, or what was probably two families of four and five respectively, and two single cock birds. Each afternoon these would unite and take the same route to water, down a gently sloping hillside covered with light forest, across the trail and on down to the stream at the bottom of a rather steep ravine. I watched these birds carefully day after day until I could actually recognize the individuals, in spite of the fact that they were usually well looked after by a mob of Laughing Thrushes. Then I began shooting and secured no fewer than eight birds out of the eleven. This comprised all of one family of two parents and two almost full-grown young males in first-year plumage; the adult male parent of the second family with a young female of the year, and both of the solitary cock birds—

fully adult. The tale of individuals was as follows, using Oates' nomenclature:

Family number one:

- I. Adult male. On the whole, this bird resembled *horsfieldi*, but it had the narrow rump fringe and lengthened tail of *batemani*, the intense blue, non-vermiculated rump of *mearsi*, and in addition the scarlet legs and feet of *nisbetti*. The central tail-feathers were sparingly but strongly vermiculated with white for most of their length, the terminal fifth being clear black.
2. Adult female. This bird which was constantly associated with the above cock, (in fact I secured both with one shot) was not distinguishable from females of *horsfieldi*, except for the somewhat longer tail. Well-grown as were the two young birds, more than once I saw this female allow them to take food away from her, and from this and other actions, besides the constant association of the four birds before they joined the others for the afternoon's descent to water, there is not the slightest doubt in my mind that this was a single family of Kaleege.
3. First-year male. Typical *horsfieldi* as found in Assam, with tail of normal length, but with the basal vermiculation on the inner rectrices visible for a half-inch beyond the upper tail-coverts.
4. First-year male. Between *obscurus* and *davisoni*, with characters of each form.
- The two following birds I judged to be parent and young:
  5. Adult male. Superficially close to *lineatus* with somewhat coarser vermiculations, and with the outer webs of the outer tail-feathers almost unmarked black as in *andersoni*.... The central tail-feathers were vermiculated throughout, with no hint of a pure white area. There was no trace of a rump fringe.
  6. First-year female. This bird does not correspond to the description of the females of any form. The gen-



eral color above was olive brown, very minutely vermiculated with black, except along the margins of the feathers, where the black dying out, the pure olive brown showed paler and clearer. The primaries were brownish black, densely mottled with grayish-brown on the outer webs. The secondaries were similar, with the color of the outer webs changing into that of the coverts and remainder of the upper plumage.

The chin and throat were white, tinged with brown along the margins. On the under parts the light color persisted as a well-defined buffy shaft-stripe. The rest of the feather was clear olive-brown, with but little mottling except on the center of the lower breast and abdomen, where the entire feather was irregularly blackened, especially along the enlarged shaft-stripe. The under tail-coverts were the blackest of all the contour feathers, most of them showing brown only along the margin. The outer and median tail-feathers were chestnut, obscurely but coarsely mottled with black. Toward the central pairs the chestnut changed to a brown, and the darker color became a coarse vermiculation, the lines irregular and lying obliquely to the shaft.

The facial skin was scarlet; the irides light hazel; legs and feet pale neutral. leaden gray.

I have gone into this in detail to show what variation I found among the females of this group of Pheasants.

7. Adult male. One of the solitary males was *horsfieldi* in length of tail and general markings, except that there was more vermiculation on the central tail-feathers than I have seen in any bird from Assam, and the inner wing-coverts were very strongly margined with white.
8. Adult male. The second male I shot on sight, and at such close range that I nearly blew it to pieces. At first glance it seemed to be a Silver Pheasant (*nycthemerus*) and stood out sharply from all its companions on both the occasions when I watched it work-

ing down hill. The second time I had my gun and secured it at once. It proved to be a very dark representative of what has been called *ripponi*, but differing in having greenish, instead of scarlet legs and feet.

All this astounding variety of Kaleege I found within two miles of the dâk bungalow at Pungatong, associating together, and, as I have said, with satisfactory evidence of being in families. Even if the birds were of no immediate relationship however, the fact of their remarkable variation is none the less indicative of hybridism. This is typical of what I found to exist in other parts of Burma. The Arrakan country and Annam I did not visit and hence I cannot speak at first hand with regard to the birds which inhabit those regions.

All the specimens which I gathered in northern Burma tend to exhibit this individual variation and blending of characters, and in all my observations there is nothing to show any pronounced uniformity in the forms I have mentioned. But while thus being compelled to consider these as unworthy of specific validity, there is an interesting phase of the subject in regard to certain of the other forms. Some of these Pheasants which apparently owe their peculiar color and pattern to the crossing of two feral species, seem to have found more or less isolated regions where they have become established. They thus do not transgress the rule of each species being confined to its individual range. It would seem that a saltation of sorts must have entered into these cases, to fix the evanescent hybridic characters, but this we can at present only surmise. It is difficult to know exactly how to treat these, but inasmuch as they have usurped a comparatively large extent of country, and within its limits seem to breed fairly true, I see no reason why, tentatively at least, they should not be recognized, their mode of origin being kept always in mind. As far as I know, up to the present time, there has never been intentional recognition of wild hybrids as species, but if any of the four forms which I mention ultimately prove to breed true over a definite extent of country,



I see no reason why we should not distinguish them by a distinct name. They would assuredly have as much right to one as *Carpodacus mutans*, the House Finch which was introduced less than forty years ago into the Hawaiian Islands by man, and which has received this new specific name<sup>1</sup> because its colors are now yellow or orange instead of crimson.

These Kaleege are four in number, *sharpei*, *ripponi*, *oatesi* and *cuvieri*.... The first two are perhaps most worthy of inclusion in the list of tentative hybrid species, and until we learn more of the range and variation of the remaining two, I shall give them the benefit of the doubt, and a place in this category. *G. williamsi* is a form quite widely distributed within the limits of *horsfieldi* between the Chin Mountains and the Irrawaddy, and farther to the west, but the few specimens I have seen were too variable to consider them even tentatively as other than fairly homogeneous hybrids.

I shall take up the four in order.

#### GENNÆUS SHARPEI.

*Lineatus* is found normally from sea-level up to a height of seventeen hundred and rarely two thousand feet, almost never higher, although I have one pair of these birds, almost typical, from Thandung, Toungoo, at forty-three hundred feet. Its range includes much of central Lower Burma on both banks of the Irrawaddy, as far east as 99° East Longitude. Well within this area and throughout a north and south distance of more than four hundred and twenty miles, specimens of the pheasant named *sharpei* have been taken. Usually the points of capture have been at considerable elevations, none lower than two thousand feet and ranging upward to six thousand. So it seems that, quite within the range of one of the parent species, a subordinate form has gained a foothold and, produced by the crossing of *lineatus* probably with *nycthemerus*, has by reason of a consistantly inhabited, higher elevation, been able to establish itself, and to extend in a considerable direction north and south.

Ghigi says in regard to *sharpei*, the translation being given as literally as possible: "We have seen how *G. sharpei* differs from *lineatus* in the fact that the upper parts rather than

<sup>1</sup> Grinnell, The Auk, XXIX, 1912, p. 24.

thinly and finely striped with white are over-run by a few large white-stripes; in the same manner as we have seen in the complex hybrids Nos. 47-49, which have  $\frac{1}{2}$  of *lineatus*,  $\frac{3}{8}$  of *muthura* and  $\frac{1}{8}$  only of *nycthemerus*. We might believe that in this series the character of *lineatus* might dominate, because represented by one-half, and because the two sexes of this species have taken part in its genealogy. We might also expect that the  $\frac{3}{8}$  of *muthura* would dominate over the single  $\frac{1}{8}$  of *nycthemerus* and have the effect of rendering the series darker. Instead the  $\frac{1}{8}$  *nycthemerus* dominates in a way to cause the contraction of the bands and shows how small a quantity of blood of this last may be sufficient to originate, by crossing with *lineatus*, a form identical with *sharpei*."

#### GENNAEUS RIPPONI.

To this form should be joined *jonesi*, as the two are indistinguishable from the published descriptions. I knew that *ripponi* was supposed to cover considerable territory in Yunnan and the Shan country, and indeed I found the birds in western Yunnan and as I have related, a very closely pigmented individual in northeastern Burma. Not, however, until I had access to an unexpected and unusually large amount of material was its wide distribution proved beyond doubt. For a year or more a Chinaman had assiduously collected Silver Kaleege Pheasants in various parts of Yunnan and the Northern Shan States, and when he had gathered six large bales, he boxed them up, labelled them "ducks' feathers" and shipped them via Bhamo to Rangoon, en route to the milliners of Europe. But the custom officials at Rangoon, having had previous experience with Chinamen, investigated and in place of the feathers of domestic ducks, found hundreds of skins of Silver Kaleege, with a scattering of Lady Amherst and Burmese Bar-tailed Pheasants. The bales were promptly confiscated and condemned, and at the moment when awaiting destruction I was fortunate enough to come across the great mass of skins. I began at once to set official machinery in motion and with the help of a very amiable collector of Customs and Dr. Annandale of the Indian Museum, the entire lot was turned over to me. I spent considerable time studying the fragments, and later the best skins were picked out and sent to me.

I found that about twenty-five per cent. were pure *nycthemerus* while sixty per cent. were equally typical *ripponi*, the remaining fifteen per cent. showing intermediate grades between the two. Later I compared this great lot with several *ripponi* skins and found them almost identical, though fluctuating slightly in the direction of whiter *nycthemerus* or with the blacker shades of the so-called *rufipes*. With this evidence I do not hesitate to record this form as very probably hybrid in origin, but which in some way has at present become sufficiently distributed and established to warrant a sub-specific designation.

Ghigi says: "Taking *G. nycthemerus* as a point of departure we find among my hybrids, forms which differ from it to the same extent as *G. jonesi* (*ripponi*) and *G. rufipes*. The males (*nycthemerus* x *muthura*) x *nycthemerus*, correspond exactly in their upper parts to the first of the two species now cited."

#### GENNAEUS CUVIERI AND OATESI.

The status of these two forms rests upon different evidence. Both have been obtained from the region west of the range of *lineatus* and south of *horsfieldi*; *cuvieri* from the mountains of North Arrakan and *oatesi*, farther south at about 18° North Latitude. About a dozen specimens of *cuvieri* have been taken, the first named by Temminck in 1820, while of *oatesi* only two or three are known, collected since 1893. The fact that these birds occur actually beyond the range of any other species and removed from any contiguous borders of the haunts of other Kaleege, is sufficient reason at least for giving them special mention, whether or not future exploration will extend the ranges of either *lineatus* or *horsfieldi* to include the haunts of these forms. Combined with the fine vermiculation of the upper plumage of *lineatus*, both add the white rump fringe of *horsfieldi*, so that no matter what their present status, there is little doubt as to their origin. I refrain from giving them trinomials, as no actual gradation has been discovered between them and either of the other species.



In conclusion, the Kaleege Pheasants forming the genus *Gennaeus*, seem to me to warrant the following disposition:

## FULL SPECIES.

*lineatus*  
*horsfieldi*  
*melanonotus*  
*leucomelanus*  
*albocristatus*  
*nycthemerus nycthemerus*  
*whiteheadi*  
*edwardsi*  
*swinhoii*

## SPECIES TENTATIVELY

## ADMITTED.

*sharpei*  
*nycthemerus ripponi*  
*cuvieri*  
*oatesi*

## HYBRIDS.

*affinis*  
*andersoni*  
*annamensis*  
*assimilis*  
*atlayi*  
*batemani*  
*beli*  
*cliffordi*  
*davisoni*  
*elegans*  
*granti*  
*haringtoni*  
*jonesi = ripponi*  
*macdonaldi*  
*mearsi*  
*nisbetti*  
*obscurus*  
*ommansyi*  
*prendergasti*  
*rufipes*  
*wickhami*  
*williamsi*

## SUMMARY OF NAMED HYBRID GENNAEUS.

*affinis* Oates.

Ann. Mag. Nat. His. (7) XI. 1903, p. 231.

Single male killed by Major Nisbett, river Namli, east of Myitkyina.

*andersoni* Elliot.

Proc. Zool. Soc. London, 1871, p. 137.

Type in Indian Museum, Calcutta.

Several specimens; Anderson in Yunnan; Rippon at Warar Bun, 6,000 feet, in Kachin Mountains, 30 miles east of Bhamo.

*annamensis* Grant.

Bull. Brit. Orn. Club, XIX. 1907, p. 13.

Type in British Museum.

Three specimens; Vassal, Bali region, interior of Annam.

*assimilis* Oates.

Ann. Mag. Nat. His. (7) XIV. 1904, p. 286.

Types in Oates Collection, British Museum.

Six specimens, Ruby Mines District.

*atlayi* Oates.

Ann. Mag. Nat. His. (8) V. 1910, p. 162.

Types in Oates Collection, British Museum.

Seven specimens, Atlay, Ruby Mines District.

*batemani* Oates.

Journ. Bombay Nat. His. Soc. XVII. 1906, p. 11.

Types in Oates Collection, British Museum.

Eight specimens, Districts of Katha, Myitkyina and Bhamo.

*beli* Oustalet.

Bull. Mus. Nat. His. Paris, 1898, p. 258.

Types in Paris Museum.

Several specimens; Bel, Eastern Annam between Hué and the mountains.

*cliffordi* Oates.

Ann. Mag. Nat. His. (7) XIV. 1904, p. 286.

Types in Oates Collection, British Museum.

Six specimens; Myitkyina Dist., east of Irrawaddy.

*davisoni* Grant.

Cat. Birds British Museum, XXII. 1893, p. 304.

Type male in British Museum; type female in Oates Collection, British Museum.

About ten specimens, vicinity of Bhamo and in Yunnan.

*elegans*

Listed in Oates Collection.

*granti* Oates.

Ann. Mag. Nat. His. (8) V. 1910, p. 163.

Type in British Museum.

Single male; Nisbett, Puntum, east of Sadon.

*haringtoni* Oates.

Ann. Mag. Nat. His. (8) V. 1910, p. 162.

Types in Oates Collection, British Museum.

Single pair; Harington, Nilum Kha, Bhamo District.

*jonesi* Oates (= *ripponi*).

Ibis, 1903, p. 97.

Types in British Museum.

Distribution same as *ripponi*.

*macdonaldi* Oates.

Journ. Bombay Nat. His. Soc. XVII. 1906, p. 10.

Type male in Oates Collection, British Museum.

Specimens from Chin Mountains, from Mt. Victoria to Fort White.

*mearsi* Oates.

Ann. Mag. Nat. His. (8) V. 1910, p. 164.

Type male in Oates Collection, British Museum.

Several; Mears, from Sylhet; Bateman from Kamaing, Myitkyina District; also North Khasi Hills, Manipur, Tippera, and Goalpara in Assam.



*nisbeti* Oates.

Ibis, 1903, p. 99.

Type male in British Museum.

Incomplete skin of male; Nisbett, five miles east of Sadon, 2,500 feet.

*obscurus* Oates.

Ann. Mag. Nat. His. (7) XIV. 1904, p. 283.

Type female in Oates Collection, British Museum.

Specimens from Katha District.

*ommansyi*

Listed in Oates Collection.

*prendergasti* Oates.

Jour. Bombay Nat. His. Soc. XVII. 1906, p. 10.

Specimens from North Arracan.

*rufipes* Oates.

Manual Game Birds India, Part I. 1898, p. 362.

Specimens from Ruby Mines District in the vicinity of Mogok.

*wickhami* Oates.

Manual Game Birds India, Part II. 1899, p. 495.

Type female in Oates Collection, British Museum.

Specimens from the Chin Mountains.

*williamsi* Oates.

Manual Game Birds India, Part I. 1898, p. 342.

Over thirty specimens in Oates Collection. Between Chin Mountains and the Irrawaddy. Williams, from Kalewa; others at Chindwin, near Wuntho.



## NOTES ON COSTA RICAN BIRDS

BY LEE S. CRANDALL,  
*Assistant Curator of Birds.*

### PART I.—INTRODUCTION.

After a nine days' journey on the United Fruit Company's steamer "Calamares," the writer, accompanied by T. Donald Carter as assistant, arrived at Port Limon, Costa Rica, on March 30, 1914. Our object was the gathering of living specimens for the collections of the New York Zoological Society, and when, after a stay of six weeks, we re-embarked on the "Calamares" with something over three hundred creatures, embracing all of the vertebrate classes, in our care, we felt that our efforts had not been in vain.

There was some delay in entering our luggage and it was only after a wait of several days, entailing a trip to the lovely capital city, San José, that this was finally accomplished. We were then free to repair to our proposed collecting ground, in the vicinity of Guápiles, a small village at the terminus of the Old Line Railroad, fifty-nine miles northwest of Port Limon. Here we found reasonably comfortable quarters in a small hotel conducted in connection with the general store.

The representatives of the United Fruit Company were uniformly courteous, and without their co-operation, the work would have been very difficult indeed. My thanks are due especially to Mr. W. E. Mullins, General Manager, Mr. Wilson of Guápiles, and Mr. Doswell of Port Limon. I am grateful also to Senor Juan Quesada, Senor Rafael Tristán and Mr. W. F. Milkevitch, of Kiew, Russia, all of whom contributed much to the success of the expedition.

### PART II.—ECOLOGICAL CONDITIONS.

Guápiles lies on the northern slope of the Volcan Turrialba, at an elevation of about eight hundred feet. Rainfall is of almost daily occurrence throughout the year, the seasons not



being strongly demarcated, as they are in the highlands. There are occasional periods of greater precipitation, and at these seasons there may be several days of continuous rainfall, without intermission.

The country about Guápiles is fairly level, with a gentle northward slope. Once the greatest of Costa Rican banana districts, its usefulness in that direction was destroyed by the inroads of a blight which destroyed the growing fruit. When it appeared useless to combat this trouble longer, the plantations were levelled and the land given over to cattle producing. The pastures are of considerable extent, running back on both sides of the railroad from one to two miles, where the forest commences.

The pastures or *potreros*, are very rough in character, constant effort being necessary to keep the bush from reclaiming its own. Each stream is marked by a line of trees and bushes, often extending into bits of very tangled jungle, and scattered trees are numerous. Each pasture is divided from the next by fences of barbed wire. As dead posts are unable to withstand for long the continual rain, small stakes of a softwood tree are used. These stakes begin to sprout almost at once and soon reach a height of fifteen to twenty feet. They thus form permanent fence-posts and their thick foliage provides the birds with excellent hiding and nesting places.

Bird life at this altitude is exceedingly varied, but individuals, at least at the time of our visit, were not nearly so abundant as we had been led to expect. At this season, of course, their numbers were at their lowest ebb, as nesting was just commencing, and few young birds were as yet on the wing. The adults were paired and scattered, and as there was very little fruit ripe at the time, there was no concentration.

A sharp line was noticeable between the birds of the open and of the jungle, neither group usually entering the domain of the other. The most typical species of the *potreros* were Parrots and Parrakeets (*Conurus finschi*, *C. aztec* and *Pionus senilis*); the Tanagers (*Rhamphocaelus passerinii*, *Thraupis cana cana*, *T. palmarum melanoptera*, *Tangara larvata larvata* and *Euphonia luteicapilla*); Flycatchers (*Myiozetetes texensis*

*texensis*, *M. granadensis*, *Legatus albicollis*, *Tyrannus albicollis satrapa*, *Pitangus sulphuratus derbianus* and *Megarhynchus pitangua*; Bonaparte Tawny Robin (*Planesticus grayi casius*); six of the *Fringillidæ* (*Saltator magnoides medianus*; *Arremonops conirostris richmondi*; *Sporophila morelleti*; *S. corvina*; *Tiaris olivacea pusilla* and *Volatinia jacarini splendens*); the Sooty *Synallaxis* (*S. pudica nigrifumosa*); and of course the two Vultures (*Catharista urubu brasiliensis* and *Cathartes aura aura*). The great Cacique (*Gymnostinops montezuma*) is of frequent occurrence, its colonies usually being found in open places rather than in the forest.

On entering the jungle, the bird life changes at once. Antthrushes (*Formicariidæ*) and Woodhewers (*Dendrocolaptidæ*) creep among the bushes or flit from trunk to trunk. Trogons (*Chrysotrogon caligatus*, *Trogonurus puella* and *Curucujus massena*), Black-chinned Jacamars (*Galbula melanogenia*); Puff-birds (*Bucconidæ*) and Cotingas (*Cotingidæ*) are often seen. Motmots (*Momotidæ*) are represented here by three species, but careful search did not disclose a single specimen.

There, are of course, many mammals. A small deer (*Odocoileus costaricensis*) is abundant, as are Pecarries (*Tayassu tajacu*), Agoutis (*Dasiprocta*) and Spotted Cavies (*Coelogenys paca*). A jaguar was killed during our stay at Guápiles. There are Raccoons (*Procyon lotor fernandezi*), Opossums (*Didelphys* and *Marmosa*) and Coatis (*Nasua rufa*), two species of squirrels (*Sciurus*) and at least two monkeys, the Geoffroy Spider (*Ateles geoffroyi*) and a small Capuchin (*Celius hypoleucus*).

Snakes were not abundant and few species were noted, among them *Spilotes corais*, a coral (*Elaps*), a coral-like species (*Leptognathus*), a Tree-snake (*Himantodes*), Fer-de-Lance (*Lachesis lanceolatus*) and a striped snake (*Dromicus*). Lizards of several species were abundant, especially a small *Anolis*, which lived in the shrubbery everywhere, leaping with frog-like agility.

The great Marine Toads (*Bufo agua*) were not nearly so numerous as observed by the writer in British Guiana, and were never abundant. A beautiful little red frog with blue

legs (*Dendrobates typographus typographus*) and a tiny tree-toad (*Hylotes underwoodi*) were found in the forest. Good-sized tree-toads (*Smilisca baudini*) were fairly common about Guápiles, trilling nightly from the surrounding *potreros*. A large green frog (*Rana chyrosprasina*) inhabited the banks of the streams, but was very shy and difficult to collect.

The country is well drained, the streams being numerous and very swift. One small brook, not more than three feet wide, near our headquarters, contained numerous fishes—small eels and catfishes, at least three species of Cichlids, *Astyanax æneus costaricensis*, and six species of the *Paciliidæ* (*Rivulus isthmensis*, *mollienisia sphenops tropica*, *Alfare cultratum*, *Priapichthys annectens*, *Paciliopsis pittieri* and *Brachyrhaphis umbratilis*).

Insects were not numerous. Mosquitoes were troublesome only during the early morning, but *bete rouge*, ticks and a small black fly were plentiful enough.

As the object of the expedition was the collection of living specimens, few skins were made, so these notes must be confined to those birds which we were able to observe or capture without the use of guns. No attempt has been made to give a list of species seen, as this ground already has been admirably covered by several writers, chiefly Robert Ridgway<sup>1</sup> and M. A. Carriker, Jr.,<sup>2</sup> and mention is made only of those birds concerning which some observation was made.

### PART III.—NOTES ON THE BIRDS.

April 4, 1914-May 10, 1914.

#### *Cresciscus cinereiceps* (Lawr.). ASHY-HEADED RAIL.

This tiny rail was abundant about Guápiles, being found in pairs wherever the ground had the slightest tendency toward marshiness. Its call-note is a sharp cackling, strikingly like that of *Synallaxis pudica nigrifumosa*.... The birds were breeding and on April 9, 1914, a nest was found. It was globular, about six inches in diameter and built of narrow-leaved grasses, the entrance hole being at the side. It was placed in a small clump of grass, about six inches from the ground, in the center of a

<sup>1</sup> Ridgway, Robert, Birds of Middle & North America.

<sup>2</sup> Carriker, Jr., M. A. An Annotated List of the Birds of Costa Rica, including Cocos Island.



diminutive marsh. The nest contained three eggs, creamy white, lightly blotched with pale brownish. On the following day the female was flushed from the nest, which was found to contain a single downy chick, the others perhaps having joined the father.

The young bird was clothed in thick black down, the feet and tarsi being of the same color. The beak was pure white, with a small black mark at each side of the lower mandible. The iris was dark brown.

A few days later, an adult bird was seen in a small patch of brush. When pursued it attempted to hide under some leaves and was caught by hand without difficulty.

*Asarcia variabilis* (Linn.). MEXICAN JACANA.

Not abundant about Guápiles, conditions there not being suitable. A single specimen, in the white-breasted immature plumage, was seen in a marshy pasture. It was not shy, and flew up silently when disturbed.

*Ajaia ajaja* (Linn.). ROSEATE SPOONBILL.

Although abundant along the Pacific side of Costa Rica, this bird seems to be uncommon on the Carribean coast. A single bird, not quite adult, was taken in a swamp about four miles north of Guápiles.

*Sarcoramphus papa* (Linn.). KING VULTURE.

We had been led to believe that King Vultures were both shy and rare in Costa Rica, but subsequent observations proved this not to be the case. Soon after our arrival we noticed a pair sailing overhead in company with a cloud of Black Vultures (*Catharista urubu brasiliensis*). A few days later, we came across a dying calf, surrounded by a great number of the later birds, not more than one hundred yards from our headquarters. A bullet soon ended its misery. Next morning, the carcass was untouched, although Black Vultures were in constant attendance, and on the following day a King Vulture in dark plumage was sitting on it. The bird took a leisurely flight when ap-

proached and examination showed the carcass undisturbed. The next day, three days after the death of the calf, four Kings, two adult males, one immature male and a female were feeding. These birds stayed about all day and were not at all shy, permitting persons to approach within one hundred feet. They devoured a great part of the carcass, and finally took themselves off, leaving the remainder to the greedy Blacks, which had been standing about at a respectful distance.

*Catharista urubu brasiliensis* (Bonap.)      SOUTH AMERICAN  
BLACK VULTURE.

This is the common vulture of Costa Rica. It is abundant everywhere, perching on the houses, selecting the tid-bits from the wagons of city refuse collectors, quarreling with dogs and poultry over morsels in the streets and industriously following its mission as general scavenger.

It is customary to stretch the hides of freshly killed cattle in accessible places and on several occasions vultures were noted in the act of stripping them of bits of fat and flesh, apparently doing so without injury to the hide.

It is of interest to note that the calf referred to under *Sarcoramphus papa* was dead three days before a really serious attack was made upon it. When it was first discovered, although not quite dead, the birds had removed its tail and made small incisions at various parts of its body. As soon as it was dead the eyes were extracted, but after that it remained untouched until the third day, when it was quickly devoured. This would seem to indicate that the birds were unable to penetrate the animal's hide until decomposition had softened it considerably. They hold the King Vultures in great awe, the coming of one of these great birds being the signal for the withdrawal of its meaner relatives.

On another occasion a King and a great number of Blacks were noticed perched on and about an isolated shed in a back *potrero*.... Investigation showed the shed to contain a quantity of fat, cut in strips and hung up to dry. The walls of the shed were formed by slats, the apertures being so narrow as to make the inside too dark to permit the contents to be seen

from the outside. It had not been in use for some weeks, so the birds were not in the habit of finding food there, and it seems most probable that they had been guided to the spot by the slight sense of smell which these birds seem able to exercise at short distances.

*Cathartes aura aura* (Linn.). NORTH AMERICAN TURKEY  
VULTURE.

It is curious to note that while the Black Vultures are of the South American form, the Turkey Vultures belong to the same subspecies as those of North America. They are not abundant in Costa Rica, more than a pair seldom being seen at one time. They rarely stay about slaughter houses and similar places after the habit of the Blacks, but are usually seen alone, prowling about the *potreros*.... They were shy and seemed to be in fear of the Blacks, perhaps because of the superior numbers of the latter.

*Nyctidromus albigollis albigollis* (Gmel.). CUIEJO.

This is the only common Goat Sucker about Guápiles. In the daytime, specimens were frequently disturbed as they sat on or near the ground, and at night their calls resounded from all sides.

On April 19th, three nests of this species were discovered in some open brush along an abandoned tramway. Two were about twenty-five feet apart and the other about one hundred feet distant. Each contained two pale brownish eggs, blotched with chocolate; all were fresh. One set was deposited in the hollow of a great, dried leaf; another between several smaller leaves and the third on the ground beside a large stone. No other nests were found during the entire trip and as there appeared to be nothing to distinguish this particular locality from the surrounding country, their occurrence there seems a curious coincidence.

*Chrysotrogon caligatus* (Gould). GARTERED TROGON.

This is the most abundant Trogon about Guápiles. It is met with in the bits of bush along streams and in the pastures



and may also be seen in the forest itself. It seems also to have a fondness for banana plantations, where several were seen. They are easily located by their call, a high pitched monotone resembling "toot, toot, toot—toot," rapidly repeated. This call was given alike by male, female and young, no difference being distinguishable.

This bird is almost entirely fearless and is easily approached. It is usually seen low in the trees. It was often noticed hawking for insects, which it caught with great dexterity. It feeds also on berries, which it plucks while on the wing.

On April 12th, a young bird, apparently about two weeks old, was found perched in a tangle of bushes near a banana plantation. On the following day another, and on the next a third, were taken near the same place. They were similar in size and appeared to be from the same nest. Only one pair of adults had been seen in the vicinity, which lends strength to this supposition. Unfortunately the nesting site could not be located. Although the youngsters were able to fly, the parents were evidently still caring for them, for when one was brought to the vicinity in a cage, the mother came at once to feed it.

*Curucujus massena* (Gould). MASSENA TROGON.

This bird was less abundant than *caligatus* and less easily approached. The brilliant red abdomen is a conspicuous identification mark, although even then it is not always easily seen among thick foliage. It keeps higher in the trees than *caligatus*.

The note of this species is a series of slow, guttural clucks very strikingly galline in sound, and resembling that of *caligatus* only in the method of delivery. Males only were heard calling.

*Trogonurus puella* (Gould). JALAPA TROGON.

Two specimens only of this species, male and female, were observed. These birds were seen in the jungle near the Rio Toro Amarillo, about four miles south of the railroad, at an altitude considerably below the usual range of this species.

When first noticed, the birds were feeding on the fruit of a palm, about fifteen feet high. When disturbed they perched

not far from the ground providing an excellent opportunity for observation. They were male and female and busily engaged in what appeared to be courtship manoeuvres. The voice of this species is intermediate between those of *Curucujus mas-sena* and *Chrysotrogon caligatus*, in every point—tone, volume and time. The notes of the male are slightly higher and clearer than those of the female. The former would start off with his “ku-ku-ku——ku,” raising his tail high over his back, but not spreading it. Sometimes he ducked his head and slightly opened his wings. The female would at once respond, raising her head and calling her more guttural “kuk-kuk-kuk” but not raising the wings or ducking. There was an evident attempt at alternation, but sometimes one would not wait for the other to finish and often they became so mixed that both were calling at once. This seemed an almost endless performance. Sometimes the birds sat side by side, their feathers touching, at others as much as ten feet separated them. At intervals the male would make short flights to a distance of fifty or one hundred feet. At these times he was silent. Soon he would return, flying very swiftly, with a loud buzzing of wings, to renew his love song.

*Crotophaga sulcirostris* Swains. GROOVE-BILLED ANI.

Although the country about Guápiles is largely given to stock breeding, Anis were not nearly so numerous as this species and *C. ani* have been observed in other countries. A few are usually in attendance on the cattle but they are far from abundant, as compared with former experiences.

There has been much controversy concerning the nesting habits of these birds. So much evidence has been advanced to demonstrate a communal system, under which several females lay in a single nest, that there is no denying the fact. This habit is not, however, invariable. Near our headquarters was a small orange tree, a favorite nesting place throughout the tropics, the sharp spines affording perfect protection. Here a pair of Anis had built their nest of sticks and were incubating. The female was first seen on the nest on April 2nd. Other Anis were in the vicinity, but we watched carefully day after day, and no other was ever seen in the tree. If ever a strange bird

approached, the male of the nesting pair attacked it fiercely, driving it off. When the young birds, three in number, finally left the nest, they were guarded carefully by the two parents, who watched them assiduously and did not permit the approach of any other bird. Later another pair, accompanied by two youngsters, was seen catching insects in some long grass. Whether or not this is the usual nesting habit of *Crotophaga sulcirostris* in Costa Rica I cannot say, but these birds, at least, were paired in orthodox bird fashion.

*Campephilus guatemalensis guatemalensis* (Hartl.).

GUATEMALAN IVORY-BILLED WOODPECKER.

A young bird of this species, apparently about three weeks old, was collected on May 5th. It was able to fly but was quite fearless and was caught with no difficulty. The nest was not seen.

*Synallaxis pudica nigrifumosa* (Lawr.). SOOTY SYNALLAXIS.

This little Oven-bird is one of the most characteristic species about Guápiles. Wherever there is thick, tangled undergrowth along streams or in the *potreros*, its harsh, rail-like notes are certain to be heard. Many characteristic nests were found. They are usually from two to six feet from the ground in a clump of bushes. The entire structure is of course sticks, the nest being about a foot in length and somewhat less in diameter. It is domed at the top, with a long entrance tunnel, the lumen being only sufficiently large for the passage of the bird. On April 5th a nest containing two bluish eggs was found, and on April 19th, we saw an adult pair accompanied by two full-fledged young.

*Carpodectes nitidus* Salvin. SNOWY COTINGA.

This beautiful bird is so rare that even a sight of it is an exciting experience. The species was observed on three separate occasions, but always high in the trees. We first saw two white males and a single female flying about the tops of some forest giants in a bit of pasture jungle about a mile south of



Guápiles. We next saw two males and two females under similar circumstances up the slope of Turrialba. One morning while sitting at breakfast, a snowy bird was observed crossing behind the house. We at once went outside and were rewarded by seeing five more adult males fly across singly and join the first in the top of an isolated tree in the garden. There were no females and the flock soon made off silently. We did not see them again nor could we find a nearby fruit tree in which they might have been feeding.

*Manacus candei* (Parzudaki). CANDE MANAKIN.

On April 15th, while following a tramway up the slope about two miles north of Guápiles, a loud snapping noise was heard emanating from the bush. It was a curiously familiar sound and seemed worthy of investigation. On penetrating the tangled underbrush for a hundred feet or so, a tiny glade was disclosed, about which a number of brilliant black, white and yellow birds were flitting. As soon as one perched for a second, it was recognized as *Manacus candei*. There were about twenty in the flock, the sexes approximately even. All were moving actively through the bushes, feeding on insects. Often a sombre green female would emit the single shrill call-note, which would be answered by several males. The males, besides the call note, snapped their beaks frequently, making a sharp sound, audible at a considerable distance. They also made a crackling noise, which seemed to be a very rapid series of beak-snappings. This was sometimes followed by a curious, deep grunting note.

The males pursued each other incessantly, moving in short, swift flights accompanied by a loud buzzing sound made by the emarginated outer primaries.

Very often during a period of several weeks the birds were observed in the same locality. They were never seen more than two hundred or three hundred yards from their favorite glade, and were never seen on the west side of the tramway. There was no water there, and nothing seemed to distinguish the spot from the surrounding jungle.

One male examined was in breeding condition. The stomach contained the remains of some small fruit, as well as the hard parts of insects.

*Tyrannus tyrannus* (Linn.). KINGBIRD.

While there are few records of the occurrence of this species in Costa Rica, Carriker<sup>1</sup> says it is not uncommon there as a winter visitor.

On April 19th, we saw a flock of several hundreds of these birds near Guápiles. Some small, winged insects of which we could not secure a specimen, were swarming, and the Kingbirds were dividing their attention between these and the small, purplish berries of a nearby tree. For more than a week, the flock stayed in the vicinity, feeding much on small fruits. They were silent, even on the frequent occasion of clashes with other flycatchers, especially *Pitangus* and *Myiozetetes*, in which they seemed well able to hold their own.

*Planesticus grayi casius* (Bonap.). BONAPARTE TAWNY ROBIN.

This bird certainly is the finest songster of the Caribbean lowlands. It is abundant about Guápiles where its beautiful song is a characteristic feature. It sings usually early in the morning and late in the afternoon. During the breeding season, there are few moments at these periods of the day when at least one bird cannot be heard.

We found many nests of this species, the first one on April 7th. The favorite site is in the fork of the trees composing the "live fences." As the shoots grow up about the original post, they form a perfect basket, with the top of the post for a bottom. This soon becomes covered with mosses, lichens, and various ferns and parasites, so that it is possible to hide a nest perfectly. The nests are made of mud, moss and lichens, and lined with rootlets. The five or six nests we found each contained two eggs or young birds. The eggs are pale bluish, heavily spotted with chestnut.

*Psilorhinus mexicanus cyanogenys* (Sharpe). CENTRAL AMERICAN BROWN JAY.

This species was abundant in the more open parts of the forest and about the *potreros*. It was seen almost invariably in company with *Gymnostinops montezumae*, the two species

<sup>1</sup> An Annotated List of the Birds of Costa Rica, including Cocos Island, p. 687.

uniting in good-sized flocks which searched the woodland for anything edible. The Jays seemed to act as sentinals for the rather stupid Caciques, giving their shrill alarm notes at the slightest sign of danger. It is of interest to note that a similar association of a Jay and a Cacique, both of different species from the ones here mentioned, has been recorded from British Guiana, by Mr. C. Wm. Beebe.<sup>1</sup>

As the Jays were calling, an audible popping noise could be distinguished, following the note. Careful observation showed a distension on the fore-neck, which was alternately inflated and collapsed, the cracking sound occurring at the point of greatest inflation. Examination of a freshly killed bird disclosed a sac of skin at a point just anterior to the point of the sternum. It was quite flat and measured 14 mm in length.

A captive specimen of *Psilorhinus morio morio* (Wagl.) in the Zoological Park exhibited a similar character. This bird never uttered a vocal note, but distended the cervical sac whenever he was excited, making a popping sound which could be heard at a distance of several yards. On examination of this bird after death, the sac was found lying between the branches of the furculum, 1 mm. anterior to their point of union. Deflated, it measured 13 mm. from base to tip and 19.5 mm. along the base, the tip being rounded. Dissection showed this protusion to have been formed by a simple evagination of the dermal covering of the neck. A narrow band of muscle fibres lying in the skin surrounded the base of the sac, but as these bands occur in closely allied forms (as *Cyanocitta cristata*) it is doubtful if they perform a special function in this case. The sac communicated directly with the praebronchial or interclavicular air-sac (*Saccus interclavicularis*), through a large opening in the furcular membrane, and doubtless received its air from this source.

*Seiurus noveboracensis noveboracensis* (Gmel.). NORTHERN  
WATER-THRUSH.

One living specimen was taken on April 9th and a second on the 15th. Two others were noticed during the same period.

<sup>1</sup> Our Search for a Wilderness, p. 174.



*Cassidix oryzivora mexicana* (?) (Less.). MEXICAN RICE  
GRACKLE.

*Cassidix oryzivora* is a rare species in Costa Rica, there being but two authentic records of its occurrence, and one of these is rather obscure.<sup>1</sup> There is some doubt as to the form to which Costa Rican specimens should be referred, so *mexicana* is used advisedly.

On April 26th, while examining nests of *Zarhynchus wagleri wagleri*, one was found containing two young birds about two weeks old. One differed markedly from the other, and proved to be a *Cassidix*.

Dr. Emil A. Goeldi<sup>2</sup> has described the parasitic habits of *C. oryzivora oryzivora* of Brazil, which deposits its eggs in the nests of *Cacicus persicus*, which is the common Cacique there. *Zarhynchus* is the only Cacique nesting in colonies in the higher parts of Costa Rica, and it is not remarkable that *Cassidix* should adopt this species for rearing its young.

The feathers of the young bird were quite black, the legs and feet also black, iris dark hazel. The beak and bare portions of the face, including the lores, space in front of the eyes and base of the beak, which were bare of feathers, entirely white. The gape was pale yellow. The bird exhibited the greedy habits usual in parasites and soon was able to care for itself and was brought safely to the Zoological Park.

On May 25th, faint signs of dark coloring were observed in the beak. These gradually increased, so that the change to the pure black of the adult was seen to be under way. The chief points of color increase were at each side of base and tip of both mandibles, although the patches were very irregular.

On June 25, it was noted that the anterior portions of the face and the lores were covered with pin-feathers, which soon clothed these parts. The bill was now much darker, the white tracts being greatly restricted. By August 10, the change was practically complete, only faint traces of white at the tip of the upper mandible remaining.

It is not possible to determine the particular subspecies to which this bird is referable until it becomes adult.

<sup>1</sup> Carriker. List of the Birds of Costa Rica, p. 332.

<sup>2</sup> Ibis, Vol. III. Ninth Series, 1897, pp. 361-365.

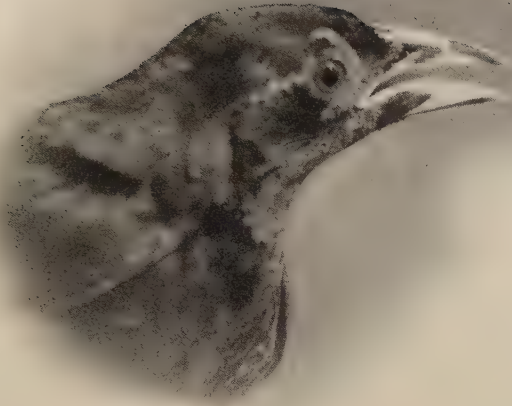


FIG. 113. June 25, 1914.

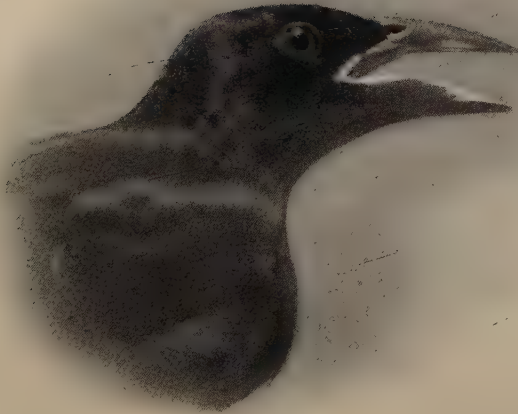


FIG. 114. July 25, 1914.

INCREASE OF PIGMENT IN THE BEAK OF *CASSIDIX*  
*ORYZIVORA MEXICANA* (Less).





On May 5th, while inspecting the nests of a colony of *Gymnostinops montezuma*, a recently hatched bird was found in company with a young *Gymnostinops*. This nestling's skin was white, with occipital, humeral, dorsal and lateral tracts, as well as a slight scattering on the thighs, well covered with long, dark gray down. The beak was white and the gape wide and yellowish. It was in striking contrast with its blackish, downless nest-mate and was no doubt a young *Cassidix*. Its behavior was quite in contrast to that of *Gymnostinops*, which shrunk to the bottom of the nest when disturbed, while the young interloper gaped eagerly for food. The two birds were of approximately the same size and equally well nourished. They could not have been more than two or three days old.

In a second nest was found an egg of *Gymnostinops* accompanied by another (Fig. 116) of quite different appearance. This egg is spotless white, rough in texture and slightly glossed. It measures 36.1 mm x 26.0 mm, which approximates the dimensions of two eggs of *Cassidix oryzivora oryzivora* in the collection of the British Museum,<sup>1</sup> and substantiates the belief that the present specimen is referable to *C. oryzivora mexicana*. It is of interest to note that the egg of *Gymnostinops montezuma* was addled and evidently deserted, while its fellow was quite fresh.

It is remarkable that with three separate evidences of the presence of *Cassidix*, not one adult bird was observed, although much time was spent in observation of colonies of both *Gymnostinops* and *Zarhynchus*. Carriker<sup>2</sup> records that in several years of collecting in Costa Rica, he saw but a single specimen of *Cassidix*, and this one at Guápiles. This bird was referred to *C. oryzivora mexicana*.

*Gymnostinops montezuma* (Less.). MONTEZUMA GIANT  
CACIQUE.

This *Oropendula* apparently is the most abundant Icterine bird of the Caribbean lowlands. Its colonies are of frequent occurrence and the birds, often in company with *Psilorhinus mexicanus cyanogenys*, are almost ubiquitous. They were

<sup>1</sup> Catalogue of the Collection of Eggs in the British Museum, Vol. V, p. 372.

<sup>2</sup> Birds of Costa Rica, etc., p. 832.

breeding at many points about Guápiles, affording an excellent opportunity for observation.

The tree most commonly used by the Caciques is known locally as the *Ceiba*. The trunk is smooth, with very thin bark, which affords no hold for tree-climbing animals, and rises to a great height before any branches spring out. The base is reinforced by wide-spreading buttresses. The trees selected are usually isolated and the majority are in open *potreros* or in similar locations, although occasionally they are in open forest. It was noted, however, that the branches are never in contact with those of neighboring trees.

The nests (Fig. 115) vary in number, from half a dozen to as many as 100. Not more than one-third of the nests in any colony examined were in use, and the occupied nests could be distinguished by their fresher appearance. It seems to be evident that nests once used are seldom if ever repaired, the birds usually building new nests, clustered in another part of the tree.

In only two cases among the many colonies observed, was there evidence of association with wasps, the birds seeming to depend for protection on the great height of the trees.

The nests are in the form of pendulous sacks, the opening being at the top, which is not domed as in *Cacicus persicus*. The length of the many examples measured varied from thirty to forty-eight inches, the average being about thirty-six inches. The diameter of the more globular lower portions averaged nine inches. In all cases, they were built chiefly of the aerial rootlets of various tree parasites, mixed with coarser, weed-like material and here and there a spray of Spanish Moss. The weaving is rather coarse, and the nest in general is not nearly so fine as that of *Zarhynchus wagleri*. The nests contain a mass of broken dried leaves, to a depth of two or three inches, which form a cushion at the bottom.

In all, the nests of three separate colonies of *Gymnostinops* were examined. The first, on April 29, consisted of nine nests of which but three were in use. Each contained a single youngster about one-half grown. In the second, on May 5, there were forty-nine nests, of which fifteen were occupied. Fourteen contained young in all stages from newly hatched chicks to nearly



FIG. 115. NEST OF *GYMNOSTINOPS MONTEZUMA*.

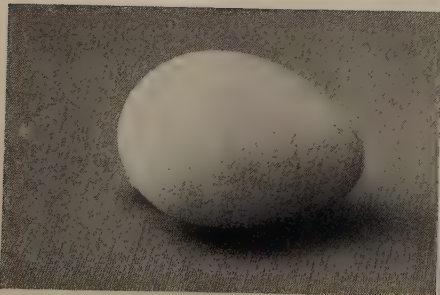


FIG. 116. EGG OF *CASSIDIX ORYZIVORA MEXICANA*.

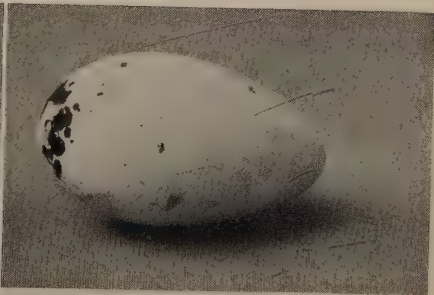


FIG. 117. EGG OF *GYMNOSTINOPS MONTEZUMA*.





fledged birds, while one contained the two eggs mentioned under *Cassidix*. In only one case did a nest contain two young *Gymnostinops*, while a *Cassidix* shared another with the single rightful inmate. The third colony, also examined on May 5, was one of nineteen nests. Only three were occupied, each containing a nearly fledged young bird. It seems probable that other young had flown, as some of the nests showed signs of recent occupancy.

It will thus be seen that of twenty-one nests containing young or eggs, in only one instance was there more than one occupant. It seems evident, then, that the normal complement of this species is but a single egg.

The egg collected measures 42.4 x 25.1 mm., seeming to be rather abnormal as to length (Fig. 117). It is a very pale bluish white, lightly spotted throughout, but heavily encircled at the larger end with chocolate blotches.

The newly hatched chicks are blackish, the skin leathery and shiny, and quite devoid of down. The beak is black, with both mandibles tipped with yellow, the gape being pale yellow.

The stomach of one young bird examined was crammed with insect remains and fruit seeds. Several very large locusts were represented, the bird apparently not being inconvenienced by the huge tibial spines.

The food of the adults is evidently of a highly varied character. Many kinds of fruits and berries enter into it, as well as such animal food as they chance to come across. Birds were observed carrying locusts, roaches and other insects to the young, and on one occasion a freshly-killed mouse was found in a nest. A dead frog given to a captive specimen was seized and passed to and fro in the great beak. The frog was then held down with one foot, Jay fashion, and each leg carefully broken, when it was swallowed without further ado.

The notes and display of the male *Gymnostinops* have been described too often to be repeated here. It was noted, however, that the male often flew against a nest with great force, so that it swung about wildly, and that the curious gymnastic performances were executed while the bird hung sideways in this perilous position.

*Zarhynchus wagleri wagleri* (Gray). WAGLER GIANT CACIQUE.

This species is found only in the highlands and usually is not found below 2,000 feet. A tramway runs from Guápiles up the slope of Turrialba for about six miles. About four miles up, at an estimated altitude of 1,800 feet, was a large colony of *Zarhynchus*, and farther on a smaller one.

The trees in these cases were not of the species chosen by *Gymnostinops*. They were less tall, narrower in girth and with the small branches covered with spines. Neither colony was associated with wasps.

The visit was made on April 26. The smaller group numbered twenty-one nests, the other forty-three, a total of sixty-four. Of these, but thirty-nine were occupied. Twenty-two contained eggs and seventeen held young in all stages of development. Of the latter one held two nearly fledged young, beside the nest which was shared with a *Cassidix*, and two others two small birds each, while two contained pairs of eggs. Thus, out of a total of thirty-nine occupied nests, only five contained more than one egg or chick. It seems, therefore, that the normal clutch of this species, as well as *Gymnostinops*, is but one egg.

The measurements of six eggs collected are as follows:

32mm. x 22.65mm.	32.9mm. x 22mm.
32.55mm. x 22.2mm.	33.3mm. x 22.6mm.
34.5mm. x 23mm.	34.2mm x 22.7mm.

They are pale greenish blue, blotched with dark brown, more heavily at the larger end.

The young have the beak quite white and the gape pale yellow.

The nests of *Zarhynchus* were composed of the same materials as were those of the larger species but, as would be expected, the former are considerably smaller. Many were measured, and all were between twenty-four and thirty inches in length, the average being about twenty-eight inches, while the diameter at the bottom averaged seven inches. The weave is much closer and finer, and the nests of the two species are dis-



tinguishable at a glance by this character alone. They were lined with bits of long, narrow leaves, some still green, of a different species from those used by *Gymnostinops*. They may have possessed some quality unpleasant to bird lice, for while the nests of *Gymnostinops* were infested with them, there were none in those of the present species. •

*Rhamphocoelus passerinii* Bonap. PASSERINI SILVER-BEAK  
TANAGER.

The most casual traveler in Costa Rica cannot but be impressed by the remarkable conspicuousness of this common bird. It is abundant everywhere, and the flashing scarlet of its lower back can be seen at a considerable distance. Very often the wings are drawn down so that the red patch is exposed to its fullest extent, and a more patent signal to passing birds of prey could hardly be imagined. Its very evident success in life can be explained only by its habit of living in the vicinity of thick bushes, into the depths of which it darts when danger threatens.

*Arremonops conirostris richmondi* Ridg. RICHMOND SPARROW.

This is one of the most abundant birds about Guápiles. It has a great variety of queer notes, its *chug-chug-chug* being characteristic of the *potreros*.

Nests were found frequently. They were placed close to the ground in a clump of weeds or grasses, in open places. They were built of coarse dried grasses and roots, domed, and with the entrance at the side. One found on April 6 contained two newly-hatched chicks, an unusually early date. The eggs are plain white, usually four in number.

